



2017 ANNUAL TECHNICAL  
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# Engineering a live UHD program from the International Space Station

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# The Challenge

- What happens when you say “wouldn’t it be cool” to Red Digital Cinema’s Jarred Land?
  - NASA has had a Red Epic Dragon on-board the ISS since 2015
  - With the REDCAST module we could use the camera as a source for a live UHD downlink, but...
  - We needed an encoder!
- AWS/Elemental built a custom encoder that would accept 4 HD-SDI outputs of 1080P @ 29.97 fps
- All flight hardware arrived at NASA’s Johnson Space Center in late October 2016
  - Certification
  - Launch
  - Testing



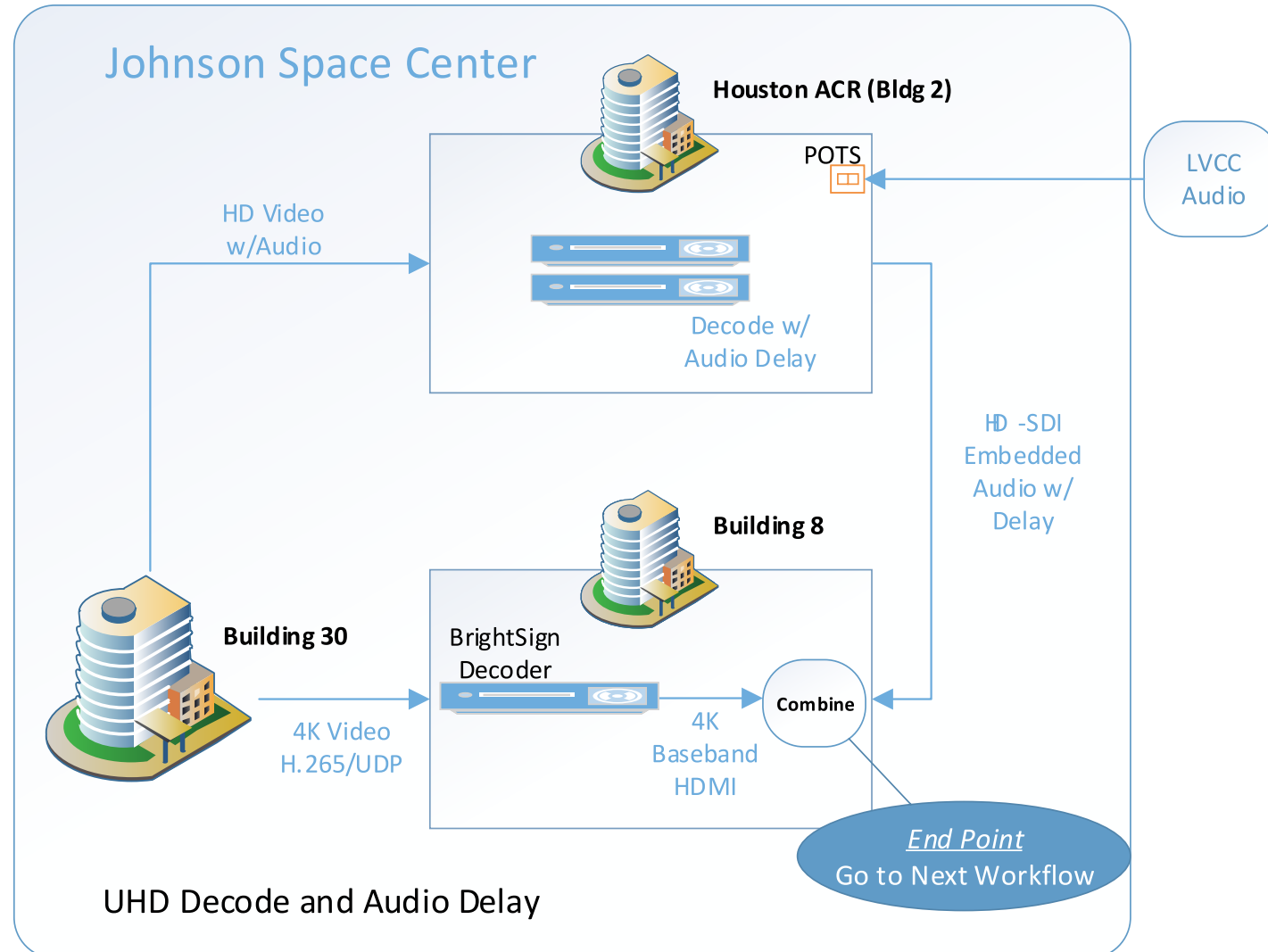
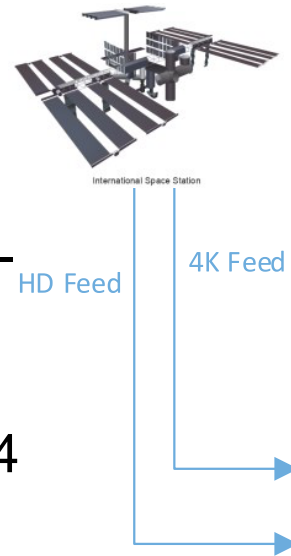
# The Hardware

- New Red Epic Dragon Camera
- REDCAST Module
- Custom Encoder with AWS/Elemental h.265 encoder
- HD-SDI cables and interface dongle for encoder



# System Testing 1/2

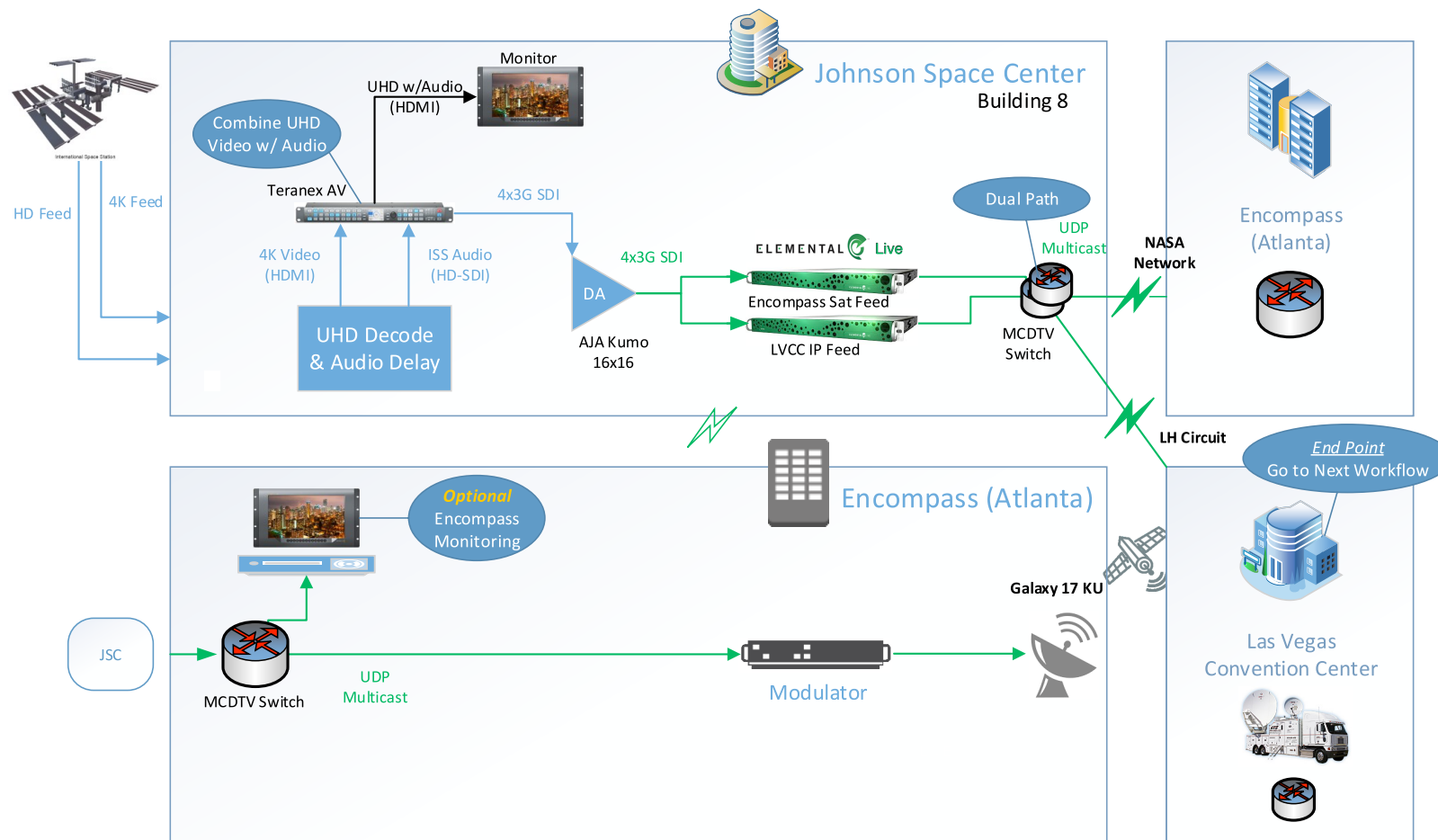
- Red/REDCAST was unable to output embedded sync audio
- Existing HD camera on-board the ISS would provide the audio
- Latency difference of ~4 seconds
- UHD video would be decoded in order to provide a synchronized UHD h.265 stream





# System Testing 2/2

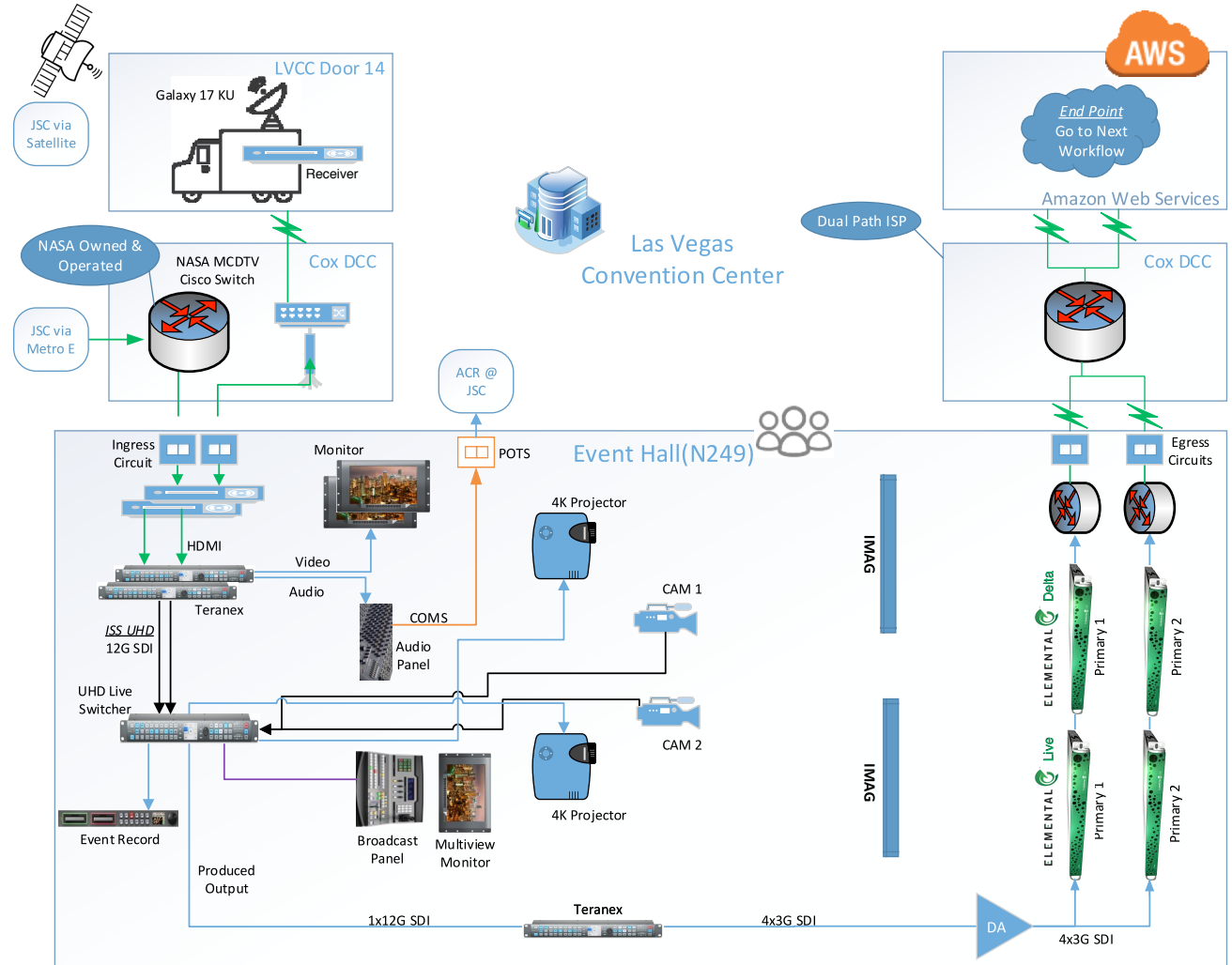
- A series of tests were conducted adding sections of the distribution architecture
- The primary path to the Las Vegas Convention Center utilized the existing NASA TV architecture through our hub @ Encompass in Atlanta
- A redundant path utilized a circuit instead of satellite
- Total latency would be 10 seconds!





# The Live Show Architecture

- AWS/Elemental produced a live UHD show of the entire NAB Super Session including the live ISS downlink
- NASA provided communications for queuing between Mission Control Houston and the ISS
- AWS/Elemental's Sam Blackman handled the latency well
- No technical glitches!

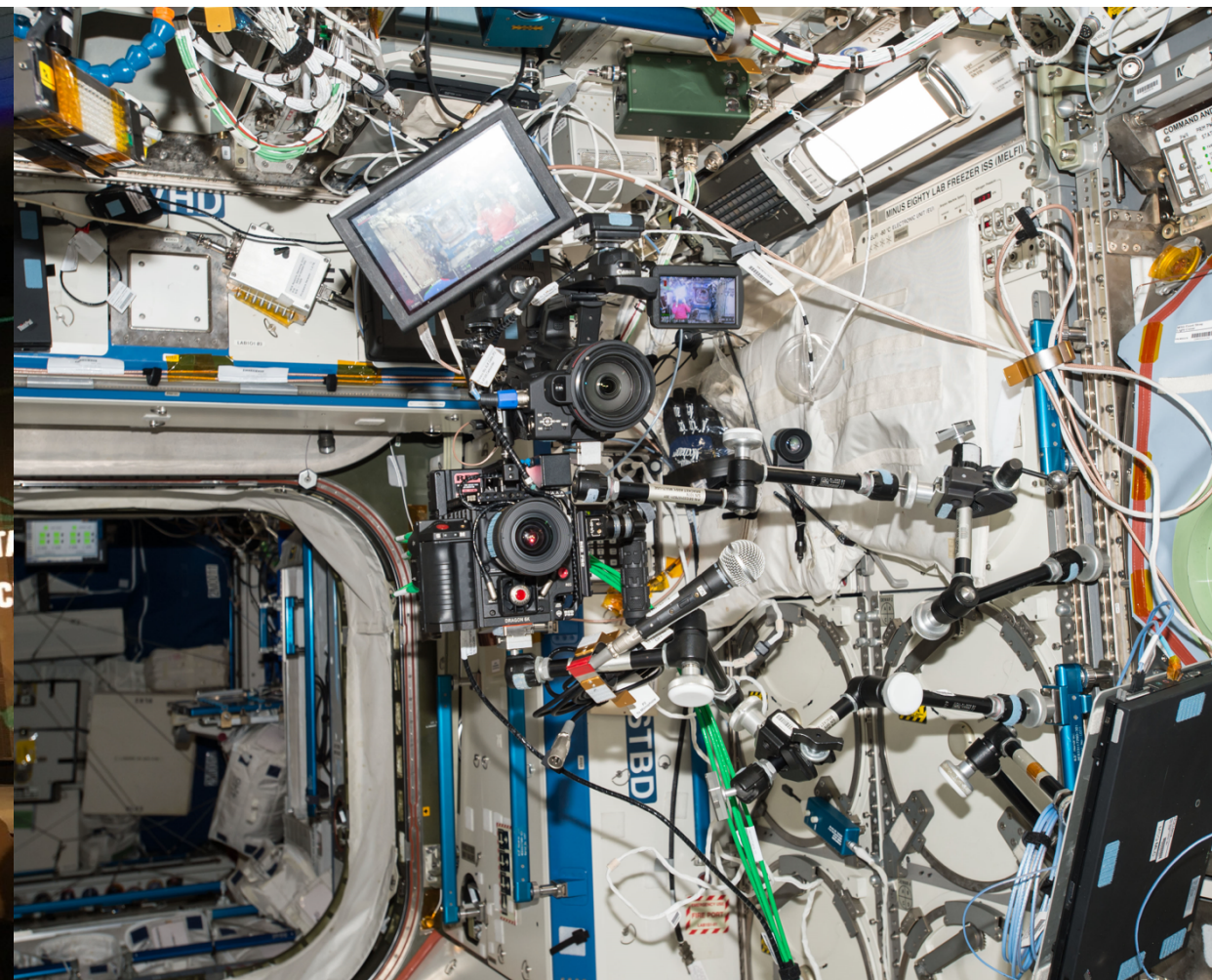






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# The Program



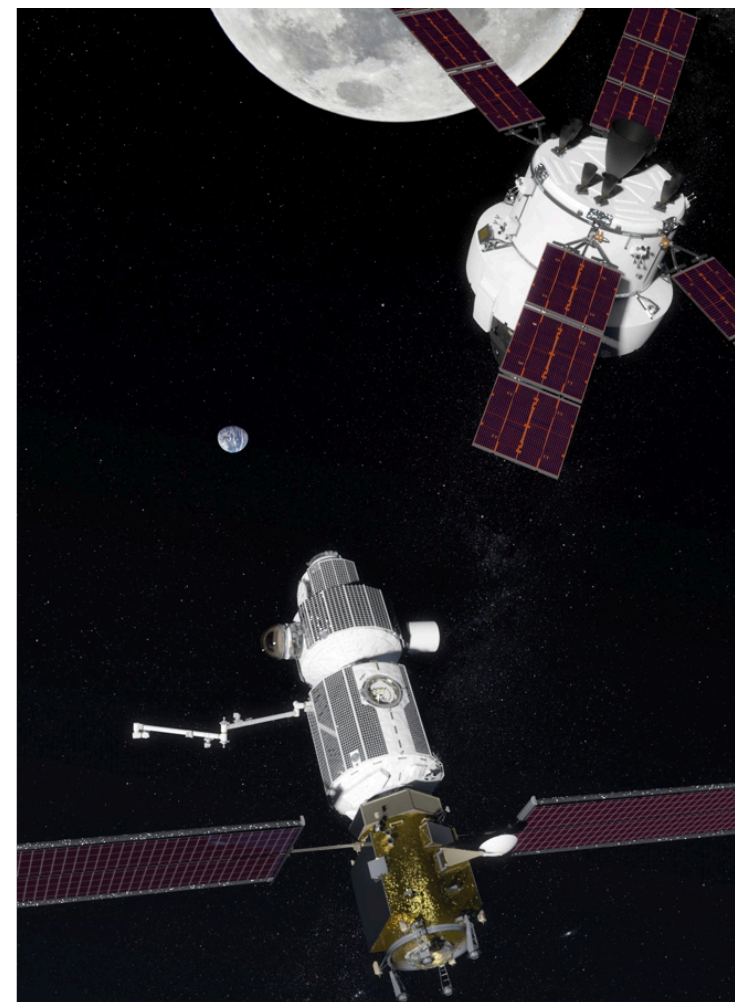
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# What's Next?



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